UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/997,604	11/29/2001	Hiroshi Nemoto	791_065	5235

25191 7590 06/28/2005

BURR & BROWN
PO BOX 7068
SYRACUSE, NY 13261-7068

EXAMINER	
TSANG FOSTER, SUSY N	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 06/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/997,604	NEMOTO ET AL.	
	Examiner	Art Unit	
	Susy N. Tsang-Foster	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-14,16-21,23 and 24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-14,16-21,23 and 24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to the amendment filed on 1/4/2005. Claims 13 and 17 have been amended. Claims 1-10, 15, and 22 have been cancelled. Claims 11-14, 16-21, 23, and 24 are pending and are finally rejected for reasons of record and for reasons necessitated by applicant's amendment.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 12 and 19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claims 12 and 19, the limitation "wherein said primary particles consist essentially of particles having at least one side of each flat crystal face of length of 1 μm or more" is not in the original disclosure.

The specification states (see page 4 of substitute specification) that the primary particles of the positive electrode active material preferably contain those primary particles in which at least one side of each flat crystal face has a length of 1 μm or more and does not state that all primary particles of the positive electrode active material have at least one side of each flat crystal face of length of 1 μm or more. The Examiner interprets the term "contain" to be synonymous with the term "comprising". Furthermore, it would be impossible to produce a positive electrode active material consisting essentially of primary particles in which at least one side of each flat crystal face of the particle has a length of 1 micron or more since not all primary particles are substantially octahedral in shape constituted mainly by flat crystal faces since some particles formed may be round and not have a flat crystal face.

The specification also states (see page 6 of substitute specification) that the positive electrode active material is characterized by consisting of primary particles mostly having the substantially octahedral shape and that all primary particles need not have a substantially octahedral shape since the particle diameters of the raw materials, the impurities in the raw materials, and the temperature distribution of the furnace during synthesis affect the growth of the crystal face and the growth of the crystal face may not take place uniformly.

Finally, the specification (see page 6 of substitute specification) also states that the particle diameters of the primary particles are obtained by analysis of the SEM image and the particle diameter measurement for individual particles are impossible. The specification also states (see page 7 of the substitute specification) that the amount of primary or secondary particles having particle diameters outside the specified ranges are at such a level not ordinarily detected in the methods of measurement for particle diameters mentioned in the specification.

Hence, there is no experimental method of determining if all the primary particles are substantially octahedral in shape and even if there were all substantially octahedral, it is impossible to determine if all the primary particles have at least side of each flat crystal face of a length of 1 micron or more since some primary particle sizes are not detectable as stated in the specification.

4. Claims 11-14, 16-21, 23, and 24 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling forming a positive electrode comprising $Li(Ni_{0.5}Ti_{0.5})_{0.15}Mn_{1.85}O_4$ as the positive electrode active material using Li_2CO_3, MnO_2, TiO_2, and NiO as the raw starting materials, the positive electrode active material having a cubic spinel structure having primary particles of substantially octahedral shape constituted mainly by flat crystal faces wherein the primary particles include particles having at least one side of each flat crystal face of 1 micron or more, does not reasonably provide enablement for forming all positive electrode material comprising mainly Li and Mn that are formed from a raw material mixture comprising Li and Mn, the positive electrode material having a cubic spinel structure and primary particles of substantially octahedral shape constituted mainly by flat crystal faces wherein the primary particles include particles having at least one side of each flat crystal face of 1 micron or more. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

The claimed invention encompasses compounds that are outside the scope of the one working example and disclosure. Not only are the claims broad, it appears that the amount of

direction, the number of working examples, and the breadth of claims are not commensurate in scope with the disclosure as originally filed. Hence undue experimentation would be required to determine what other compounds other than those disclosed by applicant can be used to make and practice applicant's invention as claimed.

With respect to enablement commensurate in scope with the claims, section 2164.08 of the MPEP states:

> "The Federal Circuit has repeatedly held that 'the specification must teach those skilled in the art how to make and use the full scope of the claimed invention without undue experimentation'. In re Wright, 999 F.2d 1557, 1561, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993)... The determination of the propriety of a rejection based upon the scope of a claim relative to the scope of the enablement involves two stages of inquiry. The first is to determine how broad the claim is with respect to the disclosure. The entire claim must be considered. The second inquiry is to determine if one skilled in the art is enabled to make and use the entire scope of the claimed invention without undue experimentation."

Factors to be considered when determining whether the claimed invention would require undue experimentation are given in MPEP 2164.01 (a). In re Wands, 858 F. 2d 731, 737; 8 USPQ 2d 1400, 1404 (Fed. Cir. 1988). Only the relevant factors will be addressed for determining undue experimentation of the presently claimed invention. The relevant factors are (A) the breadth of the claims; (B) the amount of direction provided by the inventor; (C) the existence of working examples, (D) the level of predictability in the art; and (E) the quantity of experimentation needed to make or used the invention based on the content of the disclosure.

Factor (A) Breadth of the claims:

No guidance is given in the specification for the innumerable possible embodiments encompassed by the claims of a positive electrode active material composed mainly of Li and Mn which has a cubic spinel structure and having primary particles having substantially octahedral shape constituted mainly by flat crystal faces where at least one side of each flat crystal face of length of 1 micron or more. The positive active material as recited in the claims encompasses compounds that are not lithium manganese oxide compounds disclosed in the instant specification. The specification is directed only to lithium manganese oxide positive electrode active materials and does not disclose how to make positive electrode active materials that are not lithium manganese oxide and composed mainly of Li and Mn with the properties recited in the claims.

Factor (B) The amount of direction provided by the inventor.

Applicant gives general guidance of the production of the positive electrode active material by firing a raw material mixture consisting of given proportions of salt and/or oxides of various elements, including Li, Mn, and as necessary substitution/addition elements, in an oxidizing atmosphere at 700 to 900 °C for 5 to 50 hours on page 7 of the substitute specification. Applicant also states on page 11 of the substitute specification that the morphology of the primary particles of positive electrode active material can be varied by varying the composition of the positive electrode active material even though the same synthesis conditions are employed. Applicant also only provides 1 working example and 2 comparative examples. The one working

example is given on pages 9-10 of the substitute specification where commercial powders of Li_2CO_3, MnO_2, TiO_2, NiO are mixed and then firing the resulting mixture in an oxidizing atmosphere at 800 °C for 24 hours to give primary particles having substantially octahedral shape. Comparative example 1 of the present specification is drawn to commercially available $LiMn_2O_4$ having primary particles of 0.2 microns in size and comparative example 2 of the present specification is drawn to a positive electrode active material obtained by mixing Li_2CO_3, MnO_2, and B_2O_3 to give a molar ratio of Li:Mn:B = 1:2:0.03 and then firing the resulting mixture in an oxidizing atmosphere at 800 °C for 24 hours to give a deformed and overall roundish octahedral shape where the flat crystal face of octahedron remained partially but the edges or apexes had a curved surface (see page 9 of substitute specification).

Hence, the general teaching and the examples in the specification do not give guidance on how to make positive electrode active materials having substantially octahedral shaped particles having the recited claimed dimensions that are not lithium manganese oxide, or specifically, $Li(Ni_{0.5}Ti_{0.5})_{0.15}Mn_{1.85}O_4$.

Factor (C) The existence of working examples:

As stated above, applicant's disclosure of 1 working example does not entitle applicant to claim all positive electrode active material containing Li and Mn having primary particles of substantially octahedral shape with the claimed dimensions.

MPEP 2164.03 states "[h]owever, in applications directed to inventions in arts where the results are unpredictable, the disclosure of a single species usually does not

provide an adequate basis to support generic claims."

Factor (D) The level of predictability in the art:

Applicant states on page 11 of the substitute specification that the morphology of the primary particles of positive electrode active material can be varied by varying the composition of the positive electrode active material even though the same synthesis conditions are employed which can be demonstrated by comparing working example 1 with comparative example 2. Thus, there is a level of unpredictability in the art with respect to obtaining the claimed morphology of the primary particles of the positive electrode active material.

With respect to the relationship of predictability of the art and the enablement requirement, MPEP 2164.03 states:

> "The amount of guidance or direction needed to enable the invention is inversely related to the amount of knowledge in the state of the art as well as the predictability in the art. In re Fisher, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970). The "amount of guidance or direction" refers to that information in the application, as originally filed, that teaches exactly how to make or use the invention. The more that is known in the prior art about the nature of the invention, how to make, and how to use the invention, and the more predictable the art is, the less information needs to be explicitly stated in the specification. In contrast, if little is known in the prior art about the nature of the invention and the art is unpredictable, the specification would need more detail as to how to make and use the invention in order to be enabling. >See, e.g., Chiron Corp. v. Genentech Inc., 363 F.3d 1247, 1254, 70 USPQ2d 1321, 1326 (Fed. Cir. 2004)...The "predictability or lack thereof" in the art refers to the ability of one skilled in the art to extrapolate the disclosed

> or known results to the claimed invention. If one skilled in the art can readily anticipate the effect of a change within the subject matter to which the claimed invention pertains, then there is predictability in the art. On the other hand, if one skilled in the art cannot readily anticipate the effect of a change within the subject matter to which that claimed invention pertains, then there is lack of predictability in the art. Accordingly, what is known in the art provides evidence as to the question of predictability...However, in applications directed to inventions in arts where the results are unpredictable, the disclosure of a single species usually does not provide an adequate basis to support generic claims.
> In re Soll, 97 F.2d 623, 624, 38 USPQ 189, 191 (CCPA 1938). In cases involving unpredictable factors, such as most chemical reactions and physiological activity, more may be required.
> In re Fisher, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970)[emphasis added]."

Factor (E) the quantity of experimentation needed to make or used the invention based on the content of the disclosure.

This factor has been addressed by factors (A)-(C) above.

Thus, the claims are properly rejected for scope of enablement since the two stages of inquiry as set forth in MPEP section 2164.08 have been fully addressed herein by the Examiner.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 11-14, 16-21, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the JPO machine translation of JP 08-217452 A in view of Zhong et al. (US Pat. No. 5,700,597, hereinafter '597) and Watanabe et al. (US Patent No. 6,106,975).

The JPO Machine translation of JP 08-217452 A discloses a method of manufacturing a lithium battery comprising the steps forming an electrode body by placing a positive electrode and a negative electrode in contact with a separator, the separator being positioned between the positive and the negative electrode so that the positive electrode is not in contact with the negative electrode (see Figure 1 and paragraph 81 of machine translation).

The JPO Machine translation of the reference also discloses that the positive electrode comprises a positive electrode active material which is composed mainly of Li and Mn where the Li/Mn ratio is larger than 0.5 and positive electrode active material has a cubic spinel structure (see paragraph 34 of machine translation) and primary particles mostly have a substantially octahedral shape constituted mainly by flat crystal faces (see Figure 4 and paragraphs 76 and 107) where the length of one side of the octahedron is 1 micron or more. The positive electrode contains acetylene black as an electric conduction agent (see paragraph 108 of machine translation).

The primary particle size of the positive electrode active material can also be from 1 to 10 microns (see paragraph 56 of machine translation). Furthermore, since the positive electrode active material has the same particle shape, composition, and primary particle size as those disclose in the specification and being claimed in the instant claims, the primary particles inherently include particles having at least one side of each flat crystal face of length of 1 micron

or more. The electrostatics and size of the primary particles inherently determine the size of the secondary particles and since the primary particle size range of 1 to 10 microns of JP 08-217452 A (see above) falls within the claimed range, the primary particles of JP inherently form secondary particles having a maximum particle diameter of 50 microns or less.

The positive electrode active material is formed of a raw material mixture comprising positive electrode precursor material comprising Li and Mn and heating the raw material mixture to a temperature and for a time which is effective to convert the raw material mixture into a positive electrode active material having the cubic spinel structure and primary particles having substantially octahedral shape (see paragraph 75 of machine translation).

The court has held that claiming of a property or characteristic which is inherently present in the prior art does not necessarily make the claim patentable. *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). See also MPEP 2112 and 2112.01. When the Examiner has provided a sound basis for believing that the products of the applicant and the prior art are the same, the burden of proof is shifted to the applicant to prove that the product shown in the prior art does not possess the characteristics of the claimed product. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

The JPO machine translation of JP 08-217452 A does not disclose welding a plurality of current collecting portions directly to the positive electrode and to the negative electrode and that the battery has a capacity of 2Ah, and that the battery is used in an electric vehicle or a hybrid electric vehicle.

Zhong et al. '597 teach a lithium battery as a high energy density source for an electric vehicle (col. 1, lines 20-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the lithium secondary battery in the electric vehicle because a lithium secondary battery has high energy density, is light weight, and would not cause exhaust air polluting substances during the operation of the electric vehicle.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to produce a lithium secondary battery having a capacity of 2Ah or more in order to operate a high energy consuming electronic device such as an electric vehicle since the power requirements of electronic devices differ and it would have been obvious to manufacture lithium batteries with varying capacities for different applications. A person of ordinary skill in the art would be motivated to and would be knowledgeable about how to scale up the amount of active material necessary in a lithium secondary battery in order to provide enough electricity to operate an electric vehicle or any other electronic device.

Watanabe et al. teach ultrasonically welding a plurality of tabs (current collecting portions) directly to the positive electrode and to the negative electrode so that discharge and recharge takes place entirely without loss and evenly in a large size battery (col. 1, lines 45-60 and col. 9, lines 1-14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to ultrasonically weld a plurality of tabs directly to the positive electrode and to the negative electrode so that discharge and recharge takes place entirely without loss and evenly in a large size battery such as battery having a capacity of 2Ah or more.

7. Claims 11-14, 16-21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhong et al. (US Pat. No. 5,631,104) in view of Zhong et al. (US Pat. No. 5,700,597, hereinafter '597) and Watanabe et al. (US Patent No. 6,106,975).

Applicants' claims are directed to a method of manufacturing a lithium secondary battery comprising a positive electrode active material which is composed mainly of Li and Mn and has a cubic spinel structure and the primary particles of the positive electrode active material has a substantially octahedral shape constituted mainly by flat crystal faces.

Applicants disclose in the specification that the definition of "mainly composed of Li and Mn" means that part of the Mn in the lithium manganese oxide $LiMn_2O_4$ may be replaced by other elements such as an element selected from the group consisting of Li, Fe, Mn, Ni, Mg, Zn, B, Al, Co, Cr, Si, Ti, Sn, P, V, Sb, Nb, Ta, Mo, and W or that the lithium manganese oxide may contain B, Mo or W as an additive (see page 6, lines 18-25 to page 7, lines 5-10 of the specification). The applicants also prefer lithium manganese oxide to have a Li/Mn molar ratio of greater than 0.5 and examples include $Li(Li_xMn_{2-x})O_4$ where Mn is partly replaced by Li, and $LiM_xMn_{2-x}O_4$ wherein Mn is partially replaced by M that is a substitution element other than Li (see page 7, lines 11-23 of the specification). Applicants also disclose on page 11, lines 5-10 that production of the positive electrode active material of the present invention is conducted by firing a raw mixture consisting of given proportions of salts and/or oxides of various element including Li, Mn, and as necessary, a substitution element and addition elements in an oxidizing atmosphere at 700 to 900 °C for 5 to 50 hours.

Zhong et al. disclose a lithium secondary battery comprising a positive electrode active material with the formula $LiNi_zMn_{2-z}O_4$ where z can be 0.05, 0.1, 0.2, 0.3, and 0.5 (col. 8, lines

11-25) and Ni is the substitution element. The battery comprises an electrode group formed by placing a positive electrode and a negative electrode in contact with the separator, the separator being positioned between the positive electrode and the negative electrode so that the positive electrode is not in contact with the negative electrode (col. 6, lines 22-27 and Figure 1). The positive electrode also contains carbon black as a conductive agent (col. 7, lines 45-50).

The positive electrode active material was synthesized with $LiMnO_2$, $NiNO_3$, and LiOH powders in appropriate amounts and heat treated at 750 °C in air for 4 hours and then the product was ground and mixed again followed by a second similar heat treatment for an additional 12 hours for z less than or equal to 0.3 (col. 8, lines 10-25). For the sample with z equal to 0.5, the first heat treatment lasted 16 hours and the second heat treatment was performed at 850 °C for 12 hours. Zhong et al. also disclose in general that the heating can be performed between about 750 and 900 °C and more than one mixing and heating step may be desirable (col. 4, lines 7-17).

Zhong et al. also disclose $LiCr_{0.5}Mn_{1.5}O_4$ as the positive electrode active material synthesized using an appropriate mixture of EMD, Cr_2O_3, and LiOH powders wherein the mixture was heat treated in air at 800 °C for 4 hours, ground, remixed, and heat treated again at 900 °C for 11 hours (applies to claim 10, col. 9, lines 32-37).

Zhong et al. also disclose $Li_{x+y}M_zMn_{2-y-z}O_4$ as the positive electrode active material where the crystal structure is spinel and M is a transition metal, $0 \leq x < 1$. $0 \leq y < 0.33$, and $0 < z < 1$ (see abstract). The positive electrode active material is prepared by mixing reactant powders comprising electrolytic manganese dioxide, a transition metal source, and a lithium source in a

stoichiometric manner followed by heating the mixture in an oxygen containing atmosphere from 750-900 °C (col. 4, lines 4-17).

Since Zhong et al. disclose identical synthesis conditions and formulas for the positive electrode active material in the lithium battery as discussed above [Zhong et al.'s formula (see abstract) encompasses the formulas $LiM_xMn_{2-x}O_4$ and $Li(Li_xMn_{2-x})O_4$] as those of the applicants, the properties cited in the instant claims 11-14 and 17-21 are inherent in the positive electrode active material of Zhong et al.

The court has held that claiming of a property or characteristic which is inherently present in the prior art does not necessarily make the claim patentable. *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). See also MPEP 2112 and 2112.01. When the Examiner has provided a sound basis for believing that the products of the applicant and the prior art are the same, the burden of proof is shifted to the applicant to prove that the product shown in the prior art does not possess the characteristics of the claimed product. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Zhong et al. (US Pat. No. 5,631,104) does not disclose welding a plurality of current collecting portions directly to the positive electrode and to the negative electrode and that the battery has a capacity of 2Ah, and that the battery is used in an electric vehicle or a hybrid electric vehicle.

Zhong et al. '597 teach a lithium battery as a high energy density source for an electric vehicle (col. 1, lines 20-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the lithium secondary battery in the electric vehicle because a lithium secondary

battery has high energy density, is light weight, and would not cause exhaust air polluting substances during the operation of the electric vehicle.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to produce a lithium secondary battery having a capacity of 2Ah or more in order to operate a high energy consuming electronic device such as an electric vehicle since the power requirements of electronic devices differ and it would have been obvious to manufacture lithium batteries with varying capacities for different applications. A person of ordinary skill in the art would be motivated to and would be knowledgeable about how to scale up the amount of active material necessary in a lithium secondary battery in order to provide enough electricity to operate an electric vehicle or any other electronic device.

Watanabe et al. teach ultrasonically welding a plurality of tabs (current collecting portions) directly to the positive electrode and to the negative electrode so that discharge and recharge takes place entirely without loss and evenly in a large size battery (col. 1, lines 45-60 and col. 9, lines 1-14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to ultrasonically weld a plurality of tabs directly to the positive electrode and to the negative electrode so that discharge and recharge takes place entirely without loss and evenly in a large size battery such as battery having a capacity of 2Ah or more.

8. Claims 11-14, 16-21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manev et al. (US Pat. No. 5,961,949) in view of Zhong et al. (US Pat. No. 5,700,597, hereinafter '597) and Watanabe et al. (US Patent No. 6,106,975).

Manev et al. disclose a lithium secondary battery comprising a positive electrode active material with the formula $Li_{1.025}Mn_{1.975}O_4$ having spinel structure and a mean particle size distribution of 2 microns (see col. 6, lines 5-10). The positive electrode active material was synthesized by heating 500g of ground MnO_2 and LiOH (raw material comprising Li and Mn) at a molar ratio of 2Li:Mn =1.05 and the mixture was fired at 750 °C for 48 hours (col. 6, lines 1-5). Manev et al. also disclose that the mixture is generally fired in the presence of a gas flow such as air or a gas mixture containing from 5 to 100 percent oxygen by volume, which is an oxidizing atmosphere (col. 4, lines 45-48). A lithium secondary battery also inherently comprises an electrode body formed by placing a positive electrode and a negative electrode in contact with the separator, the separator inherently being positioned between the positive electrode and the negative electrode so that the positive electrode is not in contact with the negative electrode so that a short-circuit does not occur and enable the battery to function. Manev et al. also disclose that the positive electrode contains a conductive agent such as carbon black (col. 5, lines 45-50).

Since Manev et al. disclose identical synthesis conditions and formula for the positive electrode active material in the lithium battery as those of the applicants as discussed above, the properties cited in the instant claims 11-14 and 17-21 are inherent in the positive electrode active material of Manev et al.

The court has held that claiming of a property or characteristic which is inherently present in the prior art does not necessarily make the claim patentable. *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). See also MPEP 2112 and 2112.01. When the Examiner has provided a sound basis for believing that the products of the applicant and the prior art are the same, the burden of proof is shifted to the applicant to prove that the product shown in

the prior art does not possess the characteristics of the claimed product. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Manev et al. does not disclose welding a plurality of current collecting portions directly to the positive electrode and to the negative electrode and that the battery has a capacity of 2Ah, and that the battery is used in an electric vehicle or a hybrid electric vehicle.

Zhong et al. '597 teach a lithium battery as a high energy density source for an electric vehicle (col. 1, lines 20-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the lithium secondary battery in the electric vehicle because a lithium secondary battery has high energy density, is light weight, and would not cause exhaust air polluting substances during the operation of the electric vehicle.

It would have also been obvious to one of ordinary skill in the art at the time the invention was made to produce a lithium secondary battery having a capacity of 2Ah or more in order to operate a high energy consuming electronic device such as an electric vehicle since the power requirements of electronic devices differ and it would have been obvious to manufacture lithium batteries with varying capacities for different applications. A person of ordinary skill in the art would be motivated to and would be knowledgeable about how to scale up the amount of active material necessary in a lithium secondary battery in order to provide enough electricity to operate an electric vehicle or any other electronic device.

Watanabe et al. teach ultrasonically welding a plurality of tabs (current collecting portions) directly to the positive electrode and to the negative electrode so that discharge and

recharge takes place entirely without loss and evenly in a large size battery (col. 1, lines 45-60 and col. 9, lines 1-14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to ultrasonically weld a plurality of tabs directly to the positive electrode and to the negative electrode so that discharge and recharge takes place entirely without loss and evenly in a large size battery such as battery having a capacity of 2Ah or more.

9. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhong et al. (US Pat. No. 5,631,104) in view of Zhong et al. (US Pat. No. 5,700,597, hereinafter '597) and Watanabe et al. (US Patent No. 6,106,975) as applied to claim 17 above and further in view of Idota et al. (US Pat. No. 5,686,203).

Zhong et al. ('104) as modified by Zhong et al. ('597) and Watanabe et al. teach all the limitations of claim 24 except that the positive electrode further comprises acetylene black. It is noted that Zhong et al. ('104) disclose the positive electrode contains carbon black as a conductive agent (col. 7, lines 45-50).

Idota et al. teach a positive electrode comprising lithium manganese oxide (col. 8, lines 35-49) as the active material, that the positive electrode can comprise a conductivity imparting agent (col. 3, lines 1-7) and that the conductivity imparting agent may be carbon black or acetylene black and that the use of acetylene black is preferred because the resulting battery has high charge and discharge capacities (col. 13, lines 29-35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use acetylene black instead of carbon black as the conductive agent in the positive

electrode of Zhong et al. ('104) because the use of acetylene black results in a battery that has high charge and discharge capacities.

10. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manev et al. (US Pat. No. 5,961,949) in view of Zhong et al. (US Pat. No. 5,700,597, hereinafter '597) and Watanabe et al. (US Patent No. 6,106,975) as applied to claim 17 above and further in view of Idota et al. (US Pat. No. 5,686,203).

Manev et al. as modified by Zhong et al. ('597) and Watanabe et al. teach all the limitations of claim 24 except that the positive electrode further comprises acetylene black. It is noted that Manev et al. also disclose that the positive electrode contains a conductive agent such as carbon black (col. 5, lines 45-50).

Idota et al. teach a positive electrode comprising lithium manganese oxide (col. 8, lines 35-49) as the active material, that the positive electrode can comprising a conductivity imparting agent (col. 3, lines 1-7) and that the conductivity imparting agent may be carbon black or acetylene black and that the use of acetylene black is preferred because the resulting battery has high charge and discharge capacities (col. 13, lines 29-35).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use acetylene black instead of carbon black as the conductive agent in the positive electrode of Manev et al. because the use of acetylene black results in a battery that has high charge and discharge capacities.

Response to Arguments

11. Applicant's arguments filed 1/4/2005 have been fully considered but they are not persuasive.

With respect to applicant's arguments regarding the 35 USC 112, first paragraph rejections for claims 12 and 19, the Examiner remains unpersuaded for reasons given above. It is especially noted that the substitute specification at page 6 states that the particle diameters of the primary particles are obtained by analysis of the SEM image and the particle diameter measurement for individual particles are impossible. The specification also states (see page 7 of the substitute specification) that the amount of primary or secondary particles having particle diameters outside the specified ranges are at such a level not ordinarily detected in the methods of measurement for particle diameters mentioned in the specification. Hence, applicant has not determined experimentally in the specification that the primary particles obtained consists essentially of primary particles that have at least side of each flat crystal face of a length of 1 micron or more. Applicant has only determined that the primary particles obtained comprise mostly of primary particles that are substantially octahedral in shape and have at least one side of each flat crystal face of a length of 1 micron or more from SEM image analysis.

Applicant's argument that the expression "consisting essentially of" renders the claim open only for the inclusion of unspecified ingredients which do not materially affect the basic and novel characteristics of the claimed invention is irrelevant because applicant did not originally disclose limiting the primary particles in the active material to be consisting essentially of primary particles that are substantially octahedral in shape and have at least side of each flat crystal face of a length of 1 micron or more. The term "comprise mostly" (found in the original

disclosure) and the term "consisting essentially of" (as presently claimed in claims 12 and 19) are not equivalent terms.

Furthermore applicant's argument that the recitation "consisting essentially of" does not require that every primary particle satisfy the recited feature, but rather that the amount (if any) of primary particles not satisfying the recited feature is not so large as to materially affect the basic and novel characteristics of the present invention is not persuasive. The basic and novel characteristic of the claimed invention is active material including primary particles that have a substantially octahedral shape constituted mainly by flat crystal faces and having at least one side of each flat crystal face of length of 1 micron or more. There is no discussion or disclosure in the specification about the relative amounts of primary particles that have the novel feature and the amount of primary particles that do not have this novel feature. Furthermore, applicant does not even know what amount of primary particles have the claimed novel feature to begin with since the applicant admits in the specification that the average diameters of the primary particles were not measured experimentally but obtained from the SEM images.

With respect to applicant's assertion on pages 9-10 of the amendment with regard to the 112 first paragraph rejections for the scope of enablement of the claims that a rejection for lack of enablement can only be made if there reason to doubt the objective truth of the statements in the specification that the invention is useful is not persuasive because the scope of enablement of the claims follows two stages of inquiry set forth in MPEP 2164.08 and the objective truth of the statements that the invention would be useful is irrelevant and has nothing to do with scope of enablement of the claims rejected under 35 USC 112 first paragraph. The two stages of inquiry set forth in MPEP 2164.08 are to first determine how broad the claim is with respect to the

disclosure and the second inquiry is to determine if one skilled in the art is enabled to make and use the entire scope of the claimed invention without undue experimentation. The Examiner has completed the two stages of inquiry above in the previous office action that is reiterated herein.

Applicant also asserted that in *In re Fuetterer* 138 USPQ 217 that the CCPA held that there is no requirement that an applicant discover which of all the salts within the generic expression in the claim would function properly in the invention. In response, the *In re Fuetterer* case is not an analogous situation to the presently claimed invention which specifically claims feature of a compound by what it is and not what it does, that is, the compound is not claimed functionally as was the situation in *In re Fuetterer*.

It is important to point out that applicant admits on pages 15-16 of the amendment filed on 1/4/2005 that processing positive electrode active material in the manner described in the present specification on page 11, lines 5-10 does not inherently result in the production of the positive electrode active material having the characteristic recited in the present claims. This admission indicates that practicing applicant's invention is unpredictable.

With respect to JP'452, the Examiner remains unpersuaded by applicant's redefinition of the term "regular-octahedron needle-like particle" in the reference. The Examiner gives the term "octahedron" in the reference and in the instant claim its plain, ordinary, and customary meaning complemented by applicant's definition of "substantially octahedral" in the substitute specification on page 6. As stated previously, the definition of a regular octahedron is an octahedron with eight equilateral triangles as faces (see Definition of Regular Octahedron [online]. Hyperdictionary, copyright 2000-2003 [retrieved on 2003-08-29]. Retrieved from the

Internet : <URL: http://www.hyperdictionary.com/dictionary/regular+octahedron>). Figures of a Six-Fold Regular Octahedron are also included in the previous Office Action which show eight equilateral triangular faces for the regular octahedron (Six-Fold Regular Octahedron [online]. Tomoko Fuse, 2002 [retrieved on 2003-08-29]. Retrieved from the Internet : <URL: http://gallery.origami.free.fr/Auteurs/Japan/fuse/gallery/Six-Fold%20Regular%20Octahedron.htm>). The Examiner also remains unpersuaded that the particles in the reference shown in Figure 4 do not fall under the broad definition of "substantially octahedral" given in the instant specification. Furthermore, page 6 of the substitute specification defines the term "substantially octahedral" broadly to be the following:

> " The primary particles seen in Fig. 1 also include particles of other shapes, that is, a) particles wherein the apex formed by intersection of four crystal faces of octahedron is not complete and is formed in the form of a plane or an edge, (b) particles wherein a different crystal face is formed at the edge formed by intersection of two crystal faces of octahedron, and (c) particles wherein one crystal face is jointly owned by two primary particles or wherein other primary particles grows from the surface of of one primary particle. These primary particles do not have a completely octahedral shape but can be regarded as a substantially octahedral shape. In the present invention, the "substantially octahedral shape" include these various shapes and further include those polyhedrons formed by partial chipping of the above shapes or by joint possession of crystal face in complicated manners between two primary particles."

Based on this broad definition for "substantially octahedral" in the specification, the regular octahedron needle-like particles of the reference can clearly be considered "substantially octahedral".

The Examiner also disagrees with applicant's arbitrary markup of Figure 4 of the reference since the quality of the figure in the reference is very poor and subject to interpretation by the applicant. Likewise, applicant's Figure 1 in the present application is also of very poor quality. The applicant has not provided any hard evidence, such as experimental evidence, that the crystals in the JP '452 reference are not substantially similar, if not identical to those of applicant's invention as shown in Figure 1 of the instant application.

With respect to art rejections of record based on Zhong et al. (US Pat. No. 5,631,104), applicant asserts that the conditions and formulas in the methods of Zhong et al. ('104) are not identical to those of the present invention and would not produce primary particles having substantially octahedral shape and that the present specification at page 11, lines 5-10 do not inherently result in production of positive electrode active materials having the characteristics recited in the present claim.

In response, the applicant has not disprove the Examiner's inherency arguments of the Zhong et al. ('104)reference because the specification states at page 11, lines 5-10 that "[p]roduction of the positive electrode active material of the present invention is conducted by firing a raw material mixture consisting of given proportions of salts and/or oxides of various element(s) and an addition element(s)], in an oxidizing atmosphere at 700-900 C for 5 to 50 hours." It is also important to note that the method in JP' 452 falls squarely within the conditions disclosed in the instant specification. Paragraph 107 of J'452 states that the raw materials were calcinated at 900 degrees C in the atmosphere, which is an oxidizing atmosphere for 10 hours.

The Examiner provided detailed reasons in the previous final office action that are reiterated in the present office action as to why the methods of Zhong et al. ('104) are identical to applicant's disclosed method and would inherently yield the product having the claimed properties. Specifically, Zhong et al's ('104) formula in the abstract encompasses those claimed by applicant as stated in the previous office action and in the present office action above. It is applicant's burden to provide experimental proof that the methods of Zhong et al. ('104) do not yield primary particles having substantially octahedral shape. Applicant made similar assertions regarding the art rejections based on Manev (US 5,961,949) of record and Examiner remains unconvinced for similar reasons given for art rejections based on the Zhong et al('104) reference. **Applicant has not experimentally shown that the methods of Zhong et al. and Manev do not produce primary particle having the claimed properties.** Since the methods incuding the raw materials, temperature, and time to produce the lithium manganese oxides of Zhong et al. and Manev are similar, if not identical to applicant's disclosure, the methods produce positive active materials that would inherently encompass primary particles having the claimed properites.

In response to applicant's assertions on page 14 of the amendment that JP '452 does not address or suggest reducing internal resistance, this feature in the preamble of the claim is not given patentable weight because this preamble language merely extolling benefits or features of the claimed invention and does not limit the claim scope. *Catalina Mktg. Int'l v. Coolsavings.com, Inc.*, 289 F.3d at 808-09, 62 USPQ2d at 1785 (Fed. Cir. 2002). There is no clear reliance of this feature in the preamble such that deletion of this feature from the preamble does not affect the steps of the method claim. Nevertheless, the art rejections of record

inherently have this benefit since all the claim limitations are met by the prior art references applied.

Applicant's assertion on page 11 of the amendment that the welding of plurality of current collecting portions directly to the electrodes contributes to the reduction of internal resistance according to the present invention is not supported by the original disclosure. The original disclosure does not state that welding the plurality of current collecting portions is the inventive feature to reduce resistance in the battery.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications should be directed to examiner Susy Tsang-Foster, Ph.D. whose telephone number is (571) 272-1293. The examiner can normally be reached on Monday through Friday from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at (571) 272-1292.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

st/ Susy Tsang-Foster

SUSY TSANG-FOSTER
PRIMARY EXAMINER